PURCHASE DESCRIPTION

TESTER, BIT ERROR RATE

GMG: TSBERT-15
SCAT 4590 / TAMCN: A7081
Solicitation No: SPRMM1-16-R-YB73

1.0 **GENERAL** This procurement requires a portable hand-held equipment capable of performing in-service and out-of-service Bit Error Rate Tests (BERT) on digital communication networks and measuring signal voltage on T1/FT1, channelized, and un-channelized links with various rates, physical interfaces, and other characteristics specified herein.

2.0 **CLASSIFICATION** The equipment shall meet the requirements of MIL-PRF-28800F class 3 for Navy shipboard, submarine, shore, and Marine Corps applications.

3.0 **OPERATIONAL REQUIREMENTS** The specifications provided below are the minimum requirements and accuracies that will meet the Government's need. The tester shall at least meet these requirements and accuracies and may provide better performance.

3.1 Mode of Operation

3.1.1 Emulation: DTE and DCE.
3.1.2 System configuration: Full-duplex, Single-transmit, and self-loop.
3.1.3 Timing: Synchronous, asynchronous, and recovered.

3.2 Timing Characteristics

3.2.1 Generator timing:
3.2.1.1 Range: Synchronous: 50 Hz - 15 MHz; Asynchronous: 50 Hz - 64 kHz; Recovered: 50 Hz - 520 kHz.
3.2.1.2 Source: Internal synthesizer, external source, and recovered.
3.2.1.3 Indicator: Shows when generator clock is present.

3.2.2 Receiver timing:
3.2.2.1 Range: Synchronous: 50 Hz - 15 MHz; Asynchronous: 50 Hz - 64 kHz; Recovered: 50 Hz - 520 kHz.
3.2.2.2 Source: Data interface, clock recovery.
3.2.2.3 Indicator: NO CLK when no generator clock is present.

3.2.3 Generator clock connector:
3.2.3.1 Clock in connector and signal level: BNC, 50 Ω, level: 1.5 Vp-p to 5 Vp-p.
3.2.3.2 Clock out connector and signal level: BNC, 50 Ω, levels: 2 Vp-p with 50 Ω terminated, 4 Vp-p unterminated.

3.2.4 Internal synthesizer: Internal frequency synthesizer:
3.2.4.1 Range: Synchronous: 50 Hz - 15 MHz; Asynchronous: 50 Hz - 20 kHz.
3.2.4.2 Accuracy: ± 5 ppm.

3.3 Data Characteristics

3.3.1 Fixed patterns: Mark, 1:1, 3 in 24, 1:7, T1-1, T1-2, T1-3, T1-4, T1-5, T1-6, and tones (1004 Hz and 1020 Hz).

3.3.2 Pseudorandom patterns: 63, 511, 2047, 2^{15} - 1, 2^{20} - 1, 2^{23} - 1, and QRSS.

3.3.3 Messages: Fox message and user programmable messages up to 2048 characters.

3.3.4 Character format (Asynchronous mode):
3.3.4.1 Data: 5,6,7, and 8 bits.
3.3.4.2 Parity: Odd, even, and none.
3.3.4.3 Stop bit: 1, 1.5, and 2 bits.

3.3.5 Error insertion: Single and fixed rate insertion.

3.4 Sync Acquisition Criteria

3.4.1 Synchronous and recovery modes: Fixed pattern data: 30 consecutive bits with no error. Pseudorandom pattern data: (30 + n) consecutive bits with no error for a 2^n - 1 pattern.

3.4.2 Asynchronous: 10 consecutive characters with no error.

3.5 Test Interval

3.5.1 Time interval: 1 second to 48 hours, 1 second resolution

3.6 Error Analysis

3.6.1 Mode: Single and continuous.

3.6.2 Test results:
3.6.2.1 Error: Bit errors, bit error rate, block errors, block error rate, and errored frame.
3.6.2.2 Performance: Error seconds, error-free seconds, % error-free seconds, available seconds, % available seconds, severely errored seconds, % severely errored seconds, and unavailable seconds.
3.6.2.3 Time: Bipolar violation seconds, elapsed seconds, error free seconds, pattern sync loss seconds, signal loss seconds, and pattern slips.
3.6.2.4 T-carrier: Bipolar violations, parity errors, CRC errors, and frame errors.
3.6.2.5 Indicators: The equipment shall have indicators for receiving Mark, Space, sync, lost sync, and data inverted.

3.7 Signal Measurements

3.7.1 Frequency: In Hz with resolution of 1 Hz and accuracy of ± 5ppm.

3.7.2 Voltage level: In V-pk and dBsx with resolution of 0.1 dB and accuracy of ± 10% of reading.

3.8 Interfaces

3.8.1 Data communication:

3.8.1.1 RS-449: Compatible with MIL-188-114 and EIA RS-449. Both 25-pin D-type and 37-pin D-type connectors shall be provided.

3.8.1.2 Other interfaces: RS-232, X.21, V.35, and EIA-530/MIL-188C.

3.8.1.3 Breakout box: The equipment shall be provided with breakout boxes for monitoring activities on supported interfaces. Virtual Break-out-Box via “soft” LEDs and user-controlled control signals shall be acceptable.

3.8.1.4 Terminations: 78Ω, 100Ω, and 124Ω nominal.

3.8.2 T1/FT1:

3.8.2.1 Input impedance: 100 Ω nominal terminated or 1000 Ω bridge.

3.8.2.2 Connector: Bantam, Weco-310, and RJ-48C.

3.8.2.3 Coding: B8ZS and AMI.

3.8.2.4 T1 framing: D4, ESF, SLC-96 and unframed.

3.8.2.5 Fractional T1: Nx64 kbps and Nx56 kbps formats where N = 1 to 24. Drop and insert capability shall be provided.

3.8.2.6 Status indicators: Real time indicators on B8ZS, loss of sync, signal loss, yellow alarm, BPV, frame/CRC errors, and pattern slips.

3.8.2.7 Scanning: The equipment shall be capable of scanning and identifying active channels among 24 FT1 channels.

3.8.2.8 Error insertion: Single error insertion.

3.8.2.9 Voice testing: The equipment shall provide a headset jack for voice testing. Through use of handset users shall be able to transmit and receive voice over T1/FT1 circuits. A handset with compatible connector shall be provided.

3.8.3 T3 interface:

3.8.3.1 Input impedance: 75 Ω nominal.

3.8.3.2 Connector: Weco-560.

3.8.3.3 Input frequency: 44.736 MHz ±100 ppm.

3.8.3.4 Coding: B3ZS.

3.8.3.5 T3 framing: M13, C-bit, and unframed.

3.8.3.6 Pattern: Fixed: 1111, 1100, 1010, and 24 bit programmable. Pseudorandom: 2^{15} - 1, 2^{20} - 1, and 2^{23} - 1.

3.8.3.7 Error insertion: Rates: single; Type: Logic, BPV, and frame.

3.8.4 OC-3 interface:

3.8.4.1 Transmit wavelength: 1310 nm.

3.8.4.2 Transmit power: -15 dBm to -9 dBm.

3.8.4.3 Receive wavelength: 1310 nm and 1550 nm.

3.8.4.4 Receive power range: -28 dBm to -9 dBm.

3.8.4.5 Receive jitter tolerance: Per Bell Core GR-253-CORE 1995.

3.8.4.6 Connectors: ST, the use of adapter cable shall be acceptable.

3.9 Di-phase The equipment shall be supplied with a diphase interface as described below.

3.9.1 Data rate: 1.2 kbps to 4,608 kbps.

3.9.2 Encoding: Diphase (Manchester) or Conditioned Diphase.

3.9.3 Transmit signal: ±3 V into 58 Ω or 135 Ω, ±6 V into 2 kΩ.

3.9.4 Transmit connector: BNC, balanced, and unbalanced.

3.9.5 Received signal: ±90 mV to ± 6 V.

3.9.6 Receive connector: BNC, unbalanced, 58 Ω, 135 Ω, and 2 kΩ minimum bridge

3.10 ISDN PRI The equipment shall be capable of providing analysis to support ISDN PRI.

3.10.1 Emulation: The equipment shall be able to emulate a user or network device on the PRI circuit.

3.10.2 Monitor: D channel.

3.10.3 Call expert: The equipment shall be capable of analyzing calls and interpret codes.

3.10.4 BER test: The equipment shall be able to perform BER tests on B channel. The BER test would be performed on the T1's residing on the ISDN PRI circuit.

3.11 Programming The equipment shall allow user to program, save at least 20 test setups to internal non-volatile memory. The equipment shall allow user to recall and execute a test setup with a single command.

3.12 Test data management

3.12.1 Test result storage: The equipment shall be capable of storing at least 100 test results in non-volatile memory.

3.12.2 Test result upload: The equipment shall provide the capability to upload stored test results to a computer running Microsoft® Windows 7 operating system for analyzing and printing. The software and associated accessories for uploading, viewing, and printing shall be provided.

3.13 Remote control

3.13.1 Local remote control: The equipment shall be provided with either IEEE-488 or USB interface for data retrieval and software upload. Accessories and software needed for interfacing with computer running Microsoft® Windows 7 operating system shall be provided.

3.14 Software upgrade Once a year, throughout the life of the contract, each test set delivered under this contract shall have software and firmware upgraded to the latest version available on the commercial market at no additional cost. Software and firmware upgrades shall be shipped to a focal point to be determined by the Contracting Officer.

3.15 Display Color display of 10 cm x 13 cm (4 in x 5 in) minimum.

3.16 Rackmount The equipment shall meet the convertible/rack-mountable requirements of MIL-PRF-28800F.

4.0 GENERAL REQUIREMENTS

4.1 Temperature

4.1.1 Operating temperature: 0°C to +40°C.

4.1.2 Storage temperature: -20°C to +60°C.

4.2 Power The equipment shall be operational with an internal DC battery.

4.2.1 Internal DC battery: Internal rechargeable batteries shall be provided for portable operation. The battery's minimum operating time shall be at least 2 hours with a maximum recharge time of 6 hours. The equipment shall be operational while being charged. A charger that accepts 110/220 + 10% Volt @ 50/60 Hz single phase shall be provided.

4.2.2 Battery indicator: A low battery indicator shall be provided.

4.3 Battery Restrictions: Per MIL-PRF-28800F, Lithium and Mercury batteries are prohibited without prior authorization. A request for approval for the use of Lithium and Mercury batteries shall be submitted with production lot delivery, after contract award. Approval shall apply only to the specific model proposed.

Exceptions: Per Naval Ordnance Safety and Security Activity (NOSSA), the use of Lithium primary (non-rechargeable) coin cell batteries meeting the following criteria is authorized for Naval personnel and on Naval activities, surface ships, submarines, and aircrafts:

- Commercially available coin cell batteries, unmodified, and used in the device recommended by the application manufacturer.
- Coin cell batteries shall only be used in single cell configurations.
- Coin cell batteries shall not be rated for more than 1 Ampere-Hour nameplate capacity.

The coin cell manufacturer and model identification/part number shall be provided at the time of submission of proposals.

4.4 Calibration interval The calibration interval shall be 12 months minimum. At the end of this interval, a minimum of 85% of the equipment shall remain in tolerance.

4.5 Accessories The equipment shall be supplied with all leads, cables, adapters, terminations and any other accessories necessary to attach to the system under test for full use of the equipment.

4.6 Weight 7 kg (15.5 lb) maximum, includes all interface modules.

4.7 Size 10 cm x 40 cm x 30 cm (4 in x 16 in x 12 in) typical.

4.8 Transit cases A soft carrying case according to MIL-PRF- 28800F shall be provided. The soft carrying case shall accommodate the equipment, unused modules, accessories, and the operator's manual.

4.9 Wireless Connectivity Any capability of the equipment to communicate wirelessly, including but not limited to Wi-Fi and Bluetooth, shall be disabled.

4.10 Technical Manual The maintenance philosophy for this unit shall be level 2 (per MIL PRF-28800F) and require maintenance to the module level of the unit. The technical manual shall conform to the level 2 maintenance philosophy. This level would be used for most equipment where maintenance and repair is an expected phase of equipment lifecycle. Board level maintenance and troubleshooting information is required. A Use and Installation manual (Operator's Manual) shall be provided separately. Maintenance and Servicing manual shall be provided to two levels of maintenance, unit operational verification level and the module level.

Information required for performance verification shall include:

- Instructions to verify equipment performance,
- List the equipment required for verification tests,
- Step-by-step instructions for test connections,
- Acceptable result criteria,
- Calibration information,
- Self-test routines.

Maintenance information shall include:

- Parts lists to the component level,
- Schematics and component layout drawings,
- Block and schematic diagrams.
- List of required test equipment and connection diagrams, and
- Sequential instructions for disassembly, repair, replacement, and reassembly shall be provided.
- Board level maintenance and troubleshooting information,
- Step-by-step instructions for troubleshooting and fault isolation,
- Expected signal levels,
- Test data sheets will be included, and as required,
- The instructions will define localizing a defective circuit card.

Parts lists shall include:

- Parts lists shall be shown on illustrations or a separate listing that includes an index or reference to other illustrations.
- Part number, cage code, and generic description.

The technical manual shall be provided in both printed and electronic formats. The printed format shall be otherwise normally provided. The electronic format shall be in Portable Document Format (PDF) - ISO 32000-1:2008. Two separate CD/DVDs are required, one shall contain the Use and Installation manual and one shall contain the Maintenance and Service manual.

The statement of copyright release:

"REPRODUCTION AND DISTRIBUTION OF THIS TECHNICAL MANUAL IS AUTHORIZED FOR U.S. GOVERNMENT PURPOSES."

shall be printed in the first two pages of each technical manual and on the surface of the CD/DVD supplied.

4.11 Training Material Training material that demonstrates the features, detailed operations and procedures with step-by-step instructions for using the equipment shall be provided. The training material shall be delivered in technical manual format.

4.12 Additional Requirements

4.12.1 Human Readable Identification Labeling:

4.12.1.1 Equipment: Per MIL-PRF-28800F, a human readable label shall be provided for all production lot units conforming with MIL-STD-130N and permanently affixed on the equipment in an easily readable location. Required fields on the label are; CAGE, part number, and serial number. Size of the label shall conform to the size of the equipment.

4.12.1.2 Case: Per MIL-PRF-28800F, a human readable metal plate shall be provided for all production lot units conforming with MIL-STD-130N and permanently affixed to the front of the transit case. Required fields on the label are; CAGE, part number, and serial number. Size of the label shall conform to the size of the case. Pressure sensitive adhesive transfer tape is required to hold the plate to the hard transit case such as 3M™ 9472LE. Soft transit cases also require labeling with permanent placement such as a metal plate affixed with rivets, screws or adhesives.

4.12.2 Shipping container: For production lot units the package or carton containing the equipment for shipment shall be marked per MIL-STD-129P.

4.12.3 Other Additional Requirements: Shall be specified in the CDRL of the solicitation.